



samlexpower®

**DC-DC
Step Up
Converters**

STEP 7
STEP 10
STEP 20

**Owner's
Manual**

Please read this
manual **BEFORE**
installing your
Converter

SECTION 1 | Safety

IMPORTANT SAFETY INSTRUCTIONS

SAVE THESE INSTRUCTIONS

This manual contains important Safety and Operating Instructions. Please read before using this unit .

The following safety symbols will be used in this manual to highlight safety and information:



WARNING!

Indicates possibility of physical harm to the user in case of non-compliance.



CAUTION!

Indicates possibility of damage to the equipment in case of non-compliance.

SECTION 2 | Description & Features

DESCRIPTION

STEP 7, STEP 10 and STEP 20 are 12VDC (Nominal) to 24 VDC (Nominal) Step Up Converters based on high performance, fixed frequency switching regulator. These are designed to deliver rated output current of 7A, 10A and 20A respectively at actual output voltage of 25VDC +/- 0.1V at no load. There is no isolation between the input and output circuits – input and output have common Negative.

STEP 20 consists of two STEP 10 units assembled together to operate in parallel.

FEATURES:

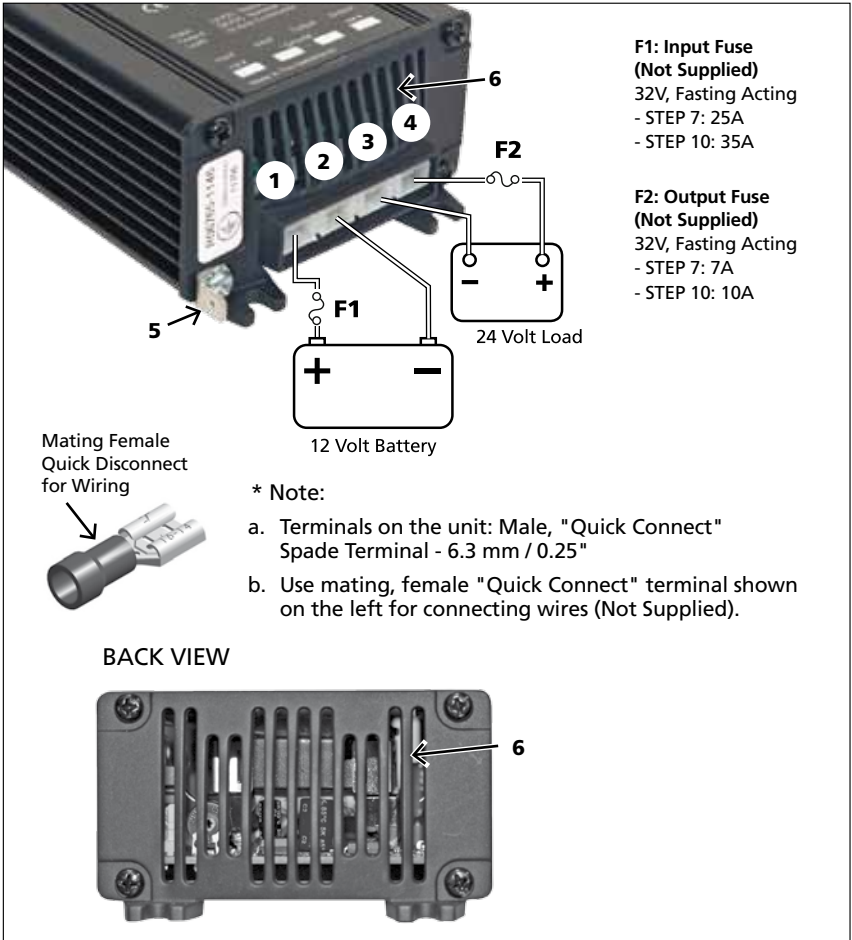
- High efficiency switching regulator
- Very low energy consumption - less than 5 mA
- Small size and light weight
- Non isolated input and output design for higher efficiency
- Protected against overload, short circuit, reverse polarity and high voltage and transient suppression on input side

SECTION 3 | Layout, Connections & Dimensions

LAYOUT AND INPUT OUTPUT CONNECTIONS

Please refer to Fig 1 for STEP 7 and STEP 10 and Fig. 2 for STEP 20

FRONT VIEW



BACK VIEW

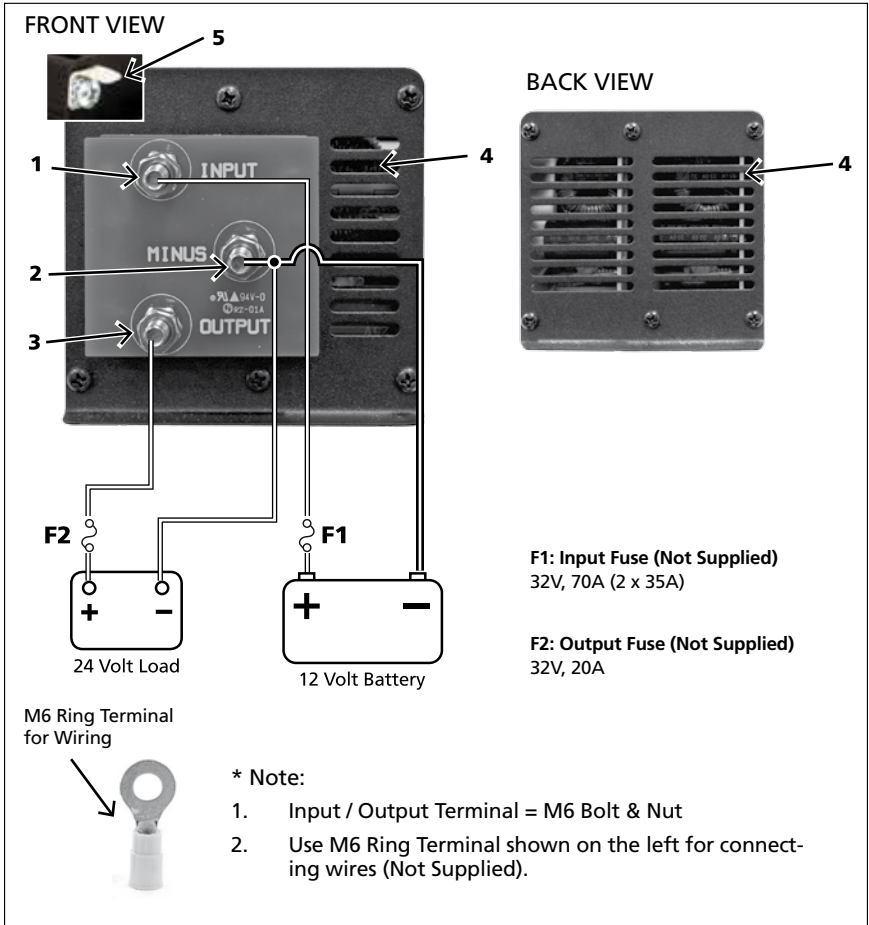


LEGEND:

- *1. Input Terminal: +12V
- *2. Input Terminal: -12V Common (-) Ground
- *3. Output Terminal: -24V Common (-) Ground
- *4. Output Terminal: +24V
- 5. System/Earth Ground
- 6. Ventilation Slots

Fig. 1: Layout & Input / Output Connections - STEP 7, STEP 10

SECTION 3 | Layout, Connections & Dimensions



LEGEND:

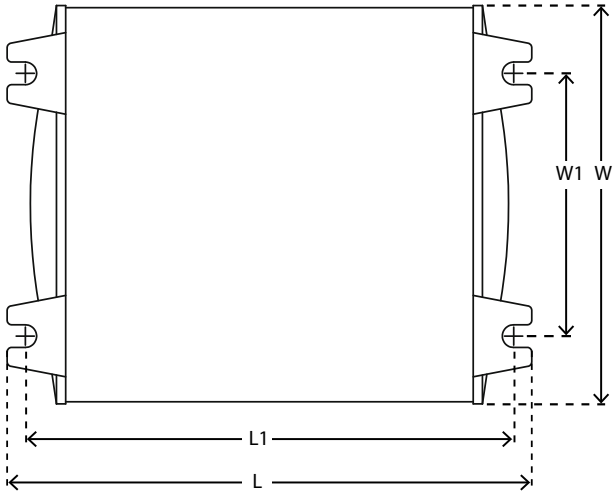
- *1. Input Terminal: +12V
- *2. Input / Output Terminal: Common (-) for 12V Input / 24V Output
- *3. Output Terminal: +24V
- 4. Ventilation Slots
- 5. System Earth Ground

Fig. 2: Layout & Input / Output Connections - STEP 20

SECTION 3 | Layout, Connections & Dimensions

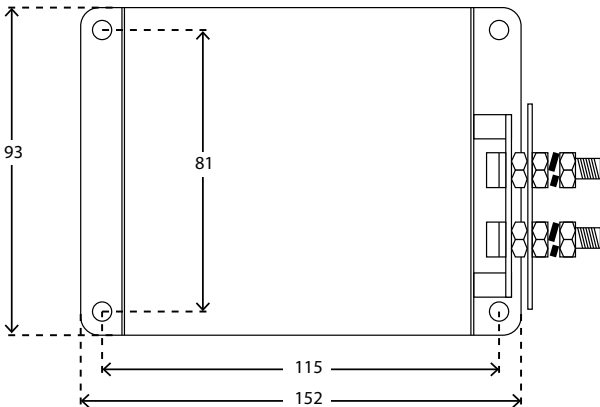
OVERALL AND MOUNTING DIMENSIONS

Please refer to Fig 3 for STEP 7 and STEP 10 and Fig. 4 for STEP 20



MODEL	OVERALL			MOUNTING	
	L	W	H	L1	W1
STEP 7	98	88	49	92	58
STEP 10	126	88	49	120	58
Mounting Hole Diameter = 5 mm					

Fig. 3: Overall & Mounting Dimensions STEP 7 and STEP 10.



Overall (Including Protrusions):
152 x 93 x 91 mm

Mounting (Between Mounting Holes):
115 x 81 mm

Diameter of Mounting Hole:
4.5 mm

Fig. 4: Overall & Mounting Dimensions STEP 20.

SECTION 4 | Installation

GENERAL INSTALLATION REQUIREMENTS

- Install the unit in a cool, dry, protected and well-ventilated space
- The unit may be installed on top of a horizontal surface or on the bottom of a horizontal surface. The unit can also be installed horizontally on a vertical surface (For safety, the Input / Output Terminals should not be pointing up or down to prevent objects falling into the unit through the ventilation openings in the front and back of the unit and short circuiting electrically live internal portions)
- The unit is cooled by convection through flow of cool air around the chassis surfaces and through the ventilation openings in the front and back of the unit. Ensure that these openings are not blocked.

INPUT AND OUTPUT CONNECTIONS



CAUTION!

PLEASE ENSURE THAT THE POLARITY OF THE INPUT / OUTPUT CONNECTION IS NOT REVERSED. A REVERSE POLARITY CONNECTION ON THE INPUT SIDE WILL BLOW INTERNAL \ EXTERNAL FUSE. THIS INTERNAL FUSE IS SOLDERED. DAMAGE DUE TO REVERSAL OF POLARITY IS NOT COVERED BY WARRANTY.

STEP 7 and STEP 10

6.3 mm / 0.25", "Quick Disconnect", Male Spade Terminal is used for input and output connections (1 to 4, Fig 1). Same type of terminal is used for grounding (5, Fig 1).

STEP 20

M-6 Bolt and Nut are used for input / output connections. 6.3 mm / 0.25", "Quick Disconnect", Male Spade Terminal is used for Grounding (4, Fig 2).

WIRE SIZING

WIRE SIZING FOR INPUT AND OUTPUT CONNECTIONS

Conductors used in wiring have resistance that opposes the current flow and produces voltage drop and heating. The resistance is directly proportional to the length of the conductor and is inversely proportional to the thickness (area of cross-section). Thus, a longer and thinner conductor will have higher resistance and will, therefore, produce higher voltage drop and more heating. The size of a conductor is designated by AWG (American Wire Gauge) #. For AWG numbers up to AWG # 1, the smaller the AWG number, the thicker the size of conductor. The size of conductor for a particular application will depend upon (i) the maximum current it is required to carry (called Ampacity) at specified temperature of the conductor / insulation and (ii) the voltage drop across the distance over which this current is carried. The size of conductors should be determined based on (i) the Ampacity and (ii) the maximum voltage drop of 2%, whichever is thicker. The wires should be multi-stranded insulated copper rated for at least 105°C.

SECTION 4 | Installation

WIRE SIZING FOR 12 VDC INPUT AND 24 VDC OUTPUT CONNECTIONS

Recommended sizes of wiring for 2% voltage drop are as follows:

STEP 7: (Input current of 20A +/- 10% at Battery Voltage of 10V and output current of 7A at 24V Nominal).

WIRE SIZE FOR 2% VOLTAGE DROP	12V INPUT SIDE			24V OUTPUT SIDE		
	3 FT	6 FT	10 FT	3 FT	6 FT	10 FT
AWG #	#12	#10	#6	#18	#16	#14

STEP 10: (Input current of 30A +/- 10% at Battery Voltage of 10V and output current of 10A at 24V Nominal).

WIRE SIZE FOR 2% VOLTAGE DROP	12V INPUT SIDE			24V OUTPUT SIDE		
	3 FT	6FT	10 FT	3 FT	6 FT	10 FT
AWG #	#10	#8	#6	#18	#16	#12

STEP 20: (Input current of 50A +/- 10% at Battery Voltage of 10V and output current of 20A at 24V Nominal).

WIRE SIZE FOR 2% VOLTAGE DROP	12V INPUT SIDE			24V OUTPUT SIDE		
	3 FT	6FT	10 FT	3 FT	6 FT	10 FT
AWG #	#8	#4	#2	#10	#8	#4

TERMINATION OF CONNECTING WIRES

STEP 7 and STEP 10: Use 6.3mm / 0.25" "Quick Connect", Female mating terminal on the connecting wiring (See Fig. 1, Page 4)

This type of terminal is available for maximum wire size of AWG #10. When using wires thicker than AWG #10, you may terminate the wire as follows:

- Use 6.3mm / 0.25" "Quick Connect" Female mating connector (AWG #10 size)
- Use around 2" piece of AWG #10 wire and crimp the connector to one end
- Solder / splice the other end of AWG #10 wire to the thicker wire

Use of short length of 2" of smaller AWG #10 wire will not increase voltage drop appreciably.

SECTION 4 | Installation

STEP 20: For connecting wires for, use M6 Ring Terminal for the wire size being used.

EXTERNAL FUSES ON THE INPUT AND OUTPUT SIDES:

Please refer to Input / Output Connection shown in Figs 1 and 2.

The input and output connections should be made through 32V fast blow fuses (For example, automotive fuses Type ATO / ATC by Bussmann / Littelfuse). The fuses should be connected in series with the Positive input and output wires. The fuse on the 12V input side should be as close to the battery Positive terminal as possible. This will prevent the possibility of overheating / melting of the input side wires in case of short circuit on the input side cabling (a battery can provide thousands of Amperes of current during short circuit condition).



WARNING!

THE WARRANTY WILL BE VOIDED IF THE ABOVE EXTERNAL FUSES ARE NOT USED.

GROUNDING

6.3 mm / 0.25", "Quick Disconnect", Male Spade Terminal is provided for grounding (5, Fig 1 for STEP 7 and STEP 10 and 5, Fig 2 for STEP 20). Use AWG #10 wire terminated with 6.3mm / 0.25" - "Quick Connect" Female mating terminal.

SECTION 5 | Specifications

PARAMETER	STEP 7	STEP 10	STEP 20
INPUT			
Input Voltage Range	9-18 VDC	9-18 VDC	9-18 VDC
Input Current at No Load	< 5mA	< 5mA	< 5mA
OUTPUT			
Output Voltage at No Load	25V ± 0.1V	25V ± 0.1V	25V ± 0.1V
Output Voltage Regulation	+0% / -5%	+0% / -5%	+0% / -5%
Output Current	7A	10A	20A
Output Noise and Ripple	< 50mV RMS	< 50mV RMS	< 50mV RMS
Peak Efficiency	92%	92%	92%
ISOLATION			
Isolation: Input to Output	No. Common Negative		
Isolation: Input/ Output to chassis	Isolated		
TEMPERATURE RISE / COOLING			
Temperature Rise after 30 Min of Operation at Full Load	30°C @ 20°C ambient		
Type of cooling	By convection (No Fan)		
PROTECTIONS			
12V Input Side Fuse (Internal)	30A	40A	80A (2x40A)
12V Input Side Fuse (External)	25A (Not supplied)	35A (Not supplied)	70A (2 x 35A) (Not supplied)
24V Output Side Fuse(Internal)	No Fuse		
24V Output Side Fuse (External)	7A (Not supplied)	10A (Not supplied)	20A (Not supplied)
Reverse Polarity on Input Side	External / Internal Input Side Fuse will blow		
High Voltage and Transient Suppression on Input Side	Will blow input side fuse at continuous input voltage > 40V. Also protects against load dump.		
Over Current	Short Circuit Proof. External 7A Fuse will blow	Short Circuit Proof. External 10A Fuse will blow	Short Circuit Proof. External 20A fuse will blow.
INPUT /OUTPUT CONNECTIONS			
Type of Connectors	Male, "Quick Connect" Spade Terminal - 6.3mm / 0.25"		M6 Bolt and Nut
COMPLIANCE			
RoHS	RoHS compliant		
European Conformity	CE marked Emission: EN50081-1 Immunity: EN50082-1		
European Automotive Directive	95/45/EC		

SECTION 5 | Specifications

PARAMETER	STEP 7	STEP 10	STEP 20
ENVIRONMENTAL			
Operating Temperature Range	-20°C / -4°F to 30°C / 86°F (De-rate linearly to zero at 70°C / 158°F)		
Humidity	95%. Non Condensing		
MECHANICAL			
Chassis	Anodized Aluminum with plastic end covers		
Dimensions (With Protrusions)	98 x 88 x 49 mm 3.9 x 3.5 x 1.9 in	126 x 88 x 49 mm 5.0 x 3.5 x 1.9 in	152 x 93 x 91 mm 6 x 3.7 x 3.6 in
Weight	0.3 kg / 0.7 lb.	0.4 kg / 0.9 lb.	1.8Kg / 4 lb.
Note: Specifications are subject to change without notice.			